

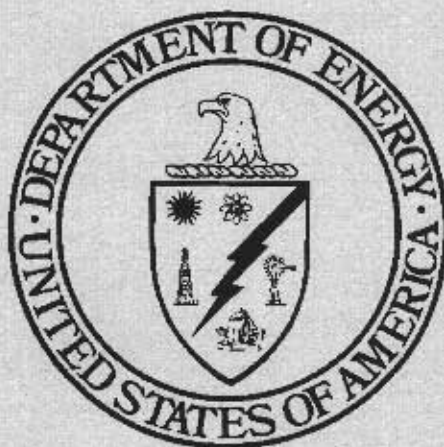


Sandia National Laboratories/New Mexico

**PROPOSAL FOR NO FURTHER ACTION
ENVIRONMENTAL RESTORATION PROJECT
SITE 151, BUILDING 9940 SEPTIC SYSTEM
OPERABLE UNIT 1295**

June 1996

**Environmental
Restoration
Project**



**United States Department of Energy
Albuquerque Operations Office**

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Prepared by
Sandia National Laboratories/New Mexico
Environmental Restoration Project
Albuquerque, New Mexico

Prepared for the
United States Department of Energy

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1. INTRODUCTION

1.1 ER Site 151, Building 9940 Septic System

Sandia National Laboratories/New Mexico (SNL/NM) is proposing a no further action (NFA) decision based on confirmatory sampling for Environmental Restoration (ER) Site 151, Building 9940 Septic System, Operable Unit (OU) 1295. ER Site 151 is listed in the Hazardous and Solid Waste Amendments (HSWA) Module IV (EPA August 1993) of the SNL/NM Resource Conservation and Recovery Act (RCRA) Hazardous Waste Management Facility Permit (NM5890110518-1) (EPA August 1992).

1.2 SNL/NM Administrative NFA Process

This proposal for a determination of a NFA decision based on confirmatory sampling was prepared using the criteria presented in Section 4.5.3 of the SNL/NM Program Implementation Plan (PIP) (SNL/NM February 1995). Specifically, this proposal "must contain information demonstrating that there are no releases of hazardous waste (including hazardous constituents) from solid waste management units (SWMUs) at the facility that may pose a threat to human health or the environment" (as proposed in 40 CFR 264.514[a] [2]) (EPA July 1990). The HSWA Module IV contains the same requirements for an NFA demonstration:

"Based on the results of the RFI [RCRA Facility Investigation] and other relevant information, the Permittee may submit an application to the Administrative Authority for a Class III permit modification under 40 CFR 270.42(c) to terminate the RFI/CMS [corrective measures study] process for a specific unit. This permit modification application must contain information demonstrating that there are no releases of hazardous waste including hazardous constituents from a particular SWMU at the facility that pose threats to human health and/or the environment, as well as additional information required in 40 CFR 270.42(c) (EPA August 1993)."

If the available archival evidence is not considered convincing, SNL/NM performs confirmatory sampling to increase the weight of the evidence and allow an informed decision on whether to proceed with the administrative-type NFA or to return to the site characterization program for additional data collection (SNL/NM February 1995).

The Environmental Protection Agency (EPA) acknowledged that the extent of sampling required may vary greatly, stating that:

the agency does not intend this rule [the second codification of HSWA] to require extensive sampling and monitoring at every SWMU. . . . Sampling is generally required only in situations where there is insufficient evidence on which to make an initial release determination. . . . The actual extent of sampling will vary . . . depending on the amount and quality of existing information available (EPA December 1987).

This request for an NFA decision for ER Site 151 is based primarily on results of a passive soil-gas survey (NERI June 1995) and analytical results of confirmatory soil samples collected at the site. Concentrations of site-specific constituents of concern (COCs) detected in the soil samples were first compared to background 95th percentile or upper tolerance limit (UTL) concentrations of COCs found in SNL/NM soils (IT March 1996) or other relevant background limits. If no SNL/NM background limit was available for a particular COC, or if the COC concentration exceeded the SNL/NM or other relevant background limit, then the constituent concentration was compared to the proposed 40 CFR Part 264 Subpart S (Subpart S) or other relevant soil action level for the compound (EPA July 1990). If the COC concentration exceeded both the background limit and relevant action level for that compound, or if no background limit or action level has been determined or proposed for the constituent, then a risk assessment was performed. The highest concentration of the particular COC identified at the site was then compared to the derived risk assessment action level to determine if the COC concentration at the site poses a significant health risk.

A site is eligible for an NFA proposal if it meets one or more of the following criteria presented in the Environmental Restoration Document of Understanding (NMED, November 1995):

- NFA Criterion 1: The site cannot be located or has been found not to exist, is a duplicate potential release site (PRS) or is located within and therefore, investigated as part of another PRS.
- NFA Criterion 2: The site has never been used for the management (that is, generation, treatment, storage, or disposal) of RCRA solid or hazardous wastes and/or constituents or other CERCLA hazardous substances.
- NFA Criterion 3: No release to the environment has occurred, nor is likely to occur in the future.
- NFA Criterion 4: There was a release, but the site was characterized and/or remediated under another authority which adequately addresses corrective action, and documentation, such as a closure letter, is available.
- NFA Criterion 5: The PRS has been characterized or remediated in accordance with current applicable state or federal regulations, and the available data indicate that contaminants pose an acceptable level of risk under current and projected future land use.

Review and analysis of the ER Site 151 soil sample analytical data indicate that concentrations of COCs detected in soils at this site are less than (1) SNL/NM or other applicable background concentrations, or (2) proposed Subpart S or other action levels, or (3) derived risk assessment action levels. Thus ER Site 151 is being proposed for an NFA decision based on confirmatory sampling data demonstrating that hazardous waste or COCs that may have been released from this SWMU into the environment pose an acceptable level of risk under current and projected future land use (Criterion 5).

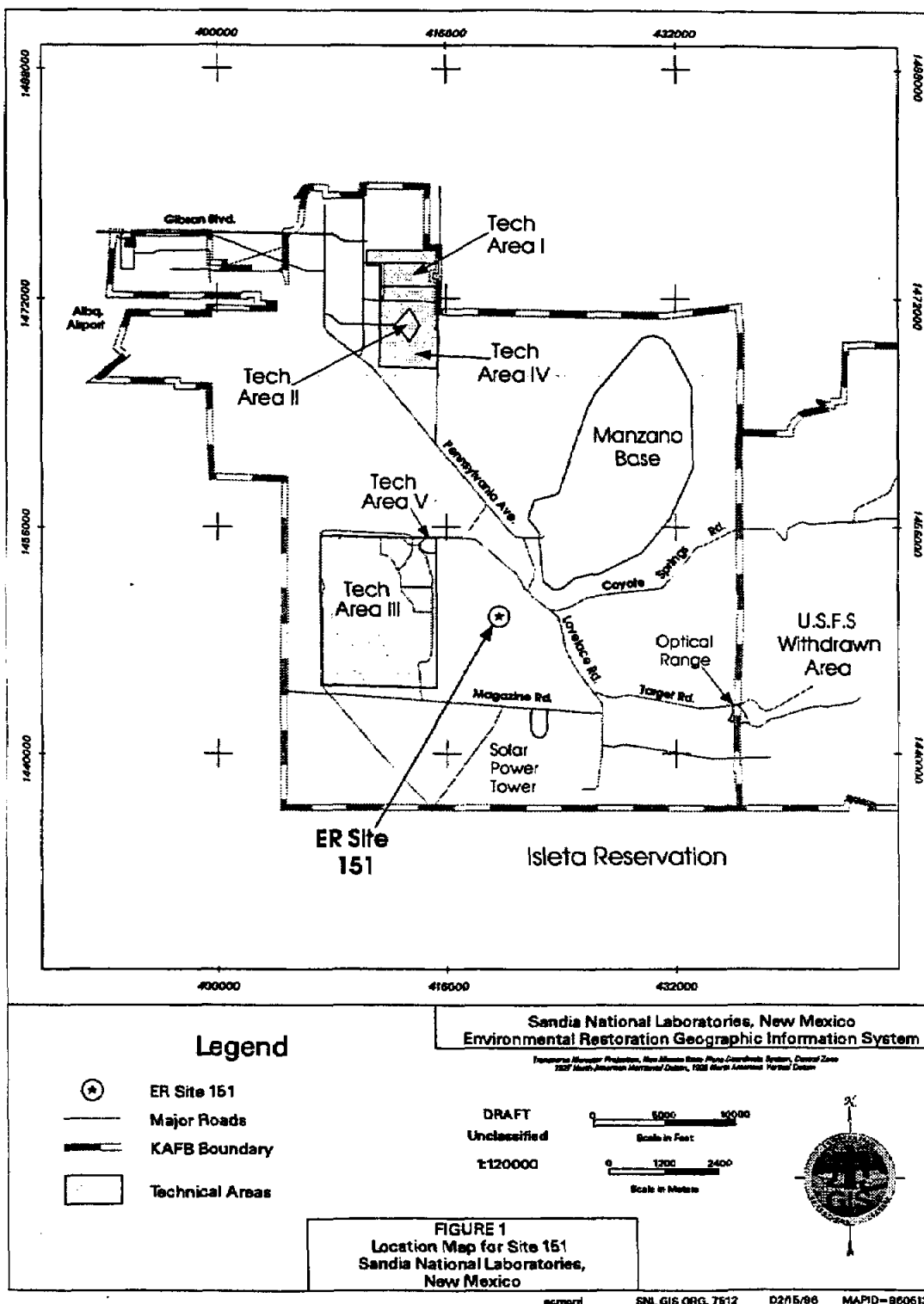
1.3 Local Setting

SNL/NM occupies 2,829 acres of land owned by the Department of Energy (DOE), with an additional 14,920 acres of land provided by land-use permits with Kirtland Air Force Base (KAFB), the United States Forest Service (USFS), the State of New Mexico, and the Isleta Indian Reservation. SNL/NM has been involved in nuclear weapons research, component development, assembly, testing, and other research and development activities since 1945 (DOE September 1987).

ER Site 151 is located in the Coyote Test Field on KAFB and is approximately 0.8 miles east of Technical Area III (TA III). Access to the site is provided by graded dirt roads that extend southwest from Lovelace Road (Figure 1-1). ER Site 151 consists of the immediate area around the seepage pit and septic tank northwest of Building 9940, and also includes the immediate area around the concrete settling tank that is south of Building 9940 (Figure 1-2). Building 9940 is built in the side of a hill. The area around the seepage pit is approximately 0.06 acres and it is at an average mean elevation of 5,524 feet above mean sea level (AMSL). The area around the concrete settling tank is also approximately 0.06 acres and it has an average mean elevation of 5,518 feet AMSL.

The surficial geology at ER Site 151 is characterized by alluvial fan deposits. Based on drilling records of similar deposits at KAFB, the alluvial materials are highly heterogeneous, composed primarily of medium to fine silty sands with frequent coarse sand, gravel, and cobble lenses. The alluvial deposits probably extend to the water-table. Vegetation consists predominantly of grasses including gramma, muhly, dropseed, and galleta. Shrubs commonly associated with the grasslands include sand sage, winter fat, saltbrush, and rabbitbush. Cacti are common, and include cholla, pincushion, strawberry, and prickly pear (SNL/NM March 1993).

Using the most recent map of the potentiometric surface for KAFB, the water-table elevation is approximated to be 5,300 feet AMSL at this location (SNL/NM March 1996). The corresponding depth to ground-water is 220 feet. However, the Tijeras fault zone complicates the potentiometric surface near this location. The potentiometric surface drops about 300 feet less than 1/2 mile west of ER Site 149. Groundwater flow at KAFB is believed to be in a generally west to northwest direction in the vicinity of this site (SNL/NM March 1996). The nearest production wells are northwest of the site and include KAFB-2, KAFB-4, and KAFB-7 which are approximately 4.2 to 5.3 miles away. The ground-water monitoring wells closest to ER Site 151 include the group of wells installed around the Chemical Waste Landfill in the southeast corner of TA III and the monitoring well at EOD Hill. ER Site 151 is about equidistant from these wells. The wells at the Chemical Waste Landfill are located approximately 1.3 miles southwest of ER Site 151 and the well at EOD Hill is located approximately 1.3 miles southeast of ER Site 151 (SNL/NM October 1995).



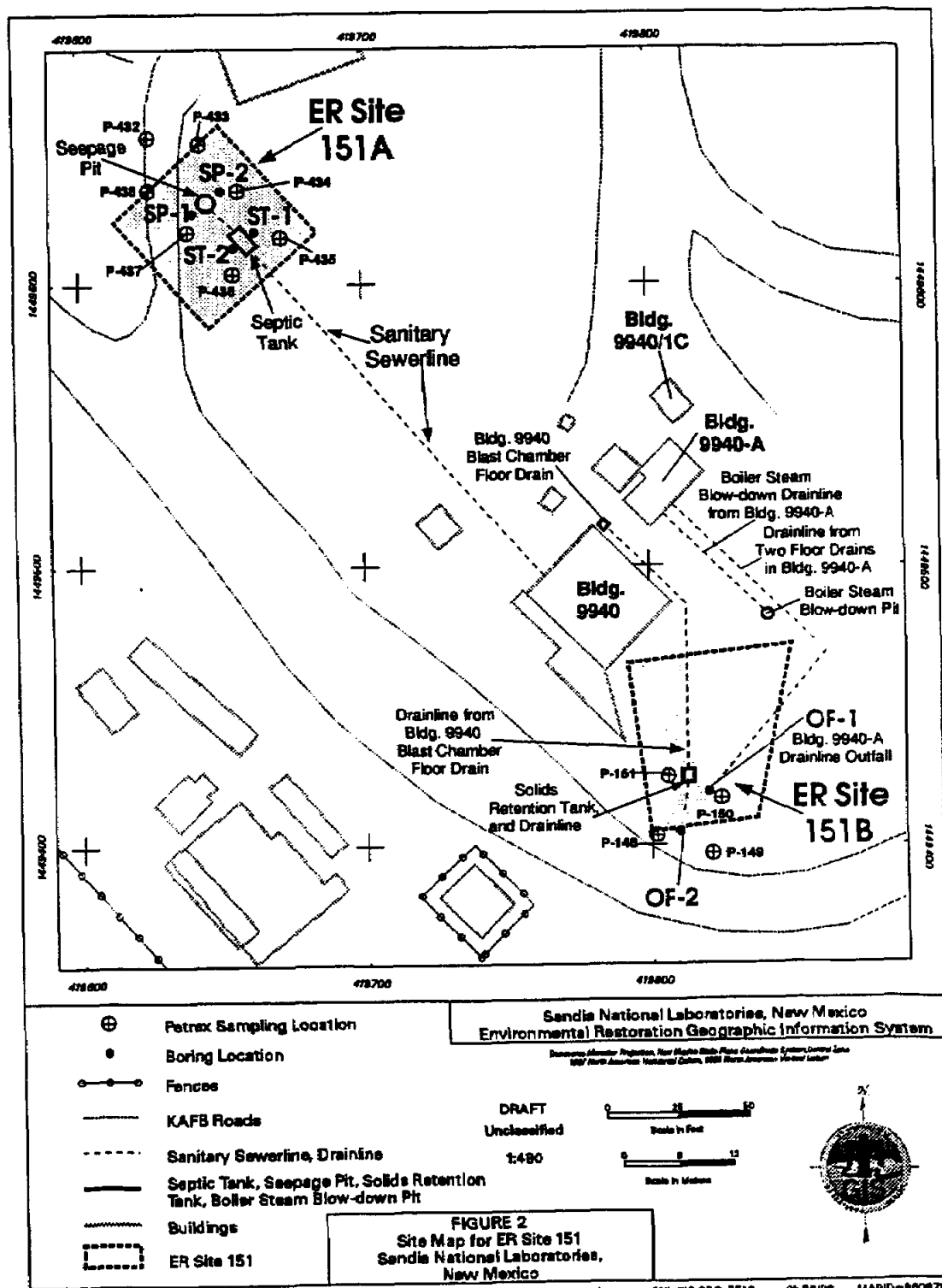


Figure 1-2: ER Site 151 Site Map

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2. HISTORY OF THE SWMU

2.1 Sources of Supporting Information

In preparing the confirmatory sampling NFA proposal for ER Site 151, available background information was reviewed to quantify potential releases and to select analytes for the soil sampling. Background information was collected from SNL/NM Facilities Engineering drawings and interviews with employees familiar with site operational history. The following sources of information, hierarchically listed with respect to assigned validity, were used to evaluate ER Site 151:

- Confirmatory subsurface soil sampling conducted in October 1994 (SNL/NM October 1994a, b) and January 1995 (SNL/NM January 1995a, b);
- Two survey reports, including a geophysical survey (Lamb 1994), and a passive soil gas survey (NERI June 1995);
- Results of samples collected from the septic tank in 1992 (SNL/NM June 1993) and 1994 (SNL/NM April 1994);
- RCRA Facility Investigation Work Plan for OU 1295, Septic Tanks and Drainfields (SNL/NM March 1993) and Comment Responses to US EPA Notice of Deficiency for the Septic Tanks and Drainfields RFI Work Plan (SNL/NM November 1994);
- Photographs and field notes collected at the site by SNL/NM ER staff;
- SNL/NM Facilities Engineering building drawings (SNL/NM April 1962, December 1980, June 1988);
- SNL/NM Geographic Information System (GIS) data; and
- The RCRA Facility Assessment (RFA) report (EPA April 1987).

2.2 Previous Audits, Inspections, and Findings

ER Site 151 was first listed as a potential release site in the RFA report to the EPA in 1987 (EPA April 1987). This report contained a generic statement about this and many other SNL/NM septic systems that sanitary and industrial wastes may have been discharged to septic tanks and drainfields during past operations. This SWMU was included in the RFA report as Site number 79, along with other septic and drain systems at SNL/NM. All the sites included in Site 79 are now designated by individual SWMU numbers.

2.3 Historical Operations

The following historical information has been excerpted from several sources, including SNL/NM March 1993, IT March 1994, and SNL/NM November 1994.

Building 9940 was constructed in 1962 as an explosive test facility. The building was originally used for explosive testing using 2-pound charges and possibly some depleted uranium. In 1978 it was converted to a U.S. Nuclear Regulatory Commission (NRC) testing facility. The NRC tests included dropping superheated metals containing iron and aluminum into vats of cooling water and documenting the reactions, and using depleted uranium in a nuclear reactor setting. Wastewater from the tests was discharged onto the ground or into the septic system. Inactive facilities at Building 9940 include an underground blast chamber and a darkroom. The septic system may have received the following contaminants from these facilities in the past: residual explosives, possibly containing depleted uranium, photoprocessing chemicals and solvents such as acetone, toluene, and MEK.

The text in the Septic Tanks and Drainfields RFI workplan originally indicated that this site included two drywells and a septic system. Further investigation and interviews at the site clarified the use of the features described as drywells in the workplan. One of the drywells was described as being located south of Building 9940 and connected to a floor drain in the underground blast chamber. The drywell is better described as a concrete settling tank, with concrete sides and bottom and a baffled drain pipe that released overflow from the tank to a surface outfall. No aggregate was placed in the tank. In the workplan, the figure for ER Site 151 did identify this feature as a concrete settling tank rather than a drywell.

The other drywell was described as being located on the southeast side of Building 9940. It is actually a steam blowdown and drain pit that served process steam equipment in Building 9940-A. The steam condensate that drained to the pit was treated before use to soften the water and remove carbon dioxide. There is no indication that any contaminants were released to the drain pit. Therefore confirmatory soil sampling was not conducted near this feature. The floor drains in Building 9940-A that were originally thought to be connected to this drain pit are piped separately to a surface outfall near the surface outfall for the concrete settling tank (see Figure 1-2).

3. EVALUATION OF RELEVANT EVIDENCE

3.1 Unit Characteristics

There are no safeguards inherent in the drain systems from Buildings 9940 or in facility operations that could have prevented past releases to the environment.

3.2 Operating Practices

As discussed in Section 2.3, effluent was released to the Building 9940 septic tank and seepage pit when the septic system was active. Also, effluent may have been released to the concrete settling tank and related surface outfall. Hazardous wastes were not managed or contained at ER Site 151.

3.3 Presence or Absence of Visual Evidence

No visible evidence of soil discoloration, staining, or odors indicating residual contamination was observed when soil samples were collected around the seepage pit and septic tank in October 1994 (SNL/NM October 1994a), or near the surface outfalls in January 1995 (SNL/NM January 1995a).

3.4 Results of Previous Sampling/Surveys

Sludge and aqueous samples were collected from the ER Site 151 septic tank in July 1992. The tank was resampled for a semivolatile organic compound (SVOC) analysis in August 1992 because the analytical laboratory surrogate recoveries for the July sample were outside the laboratory control limits and insufficient sample was available for reanalysis. The aqueous sample was analyzed for volatile organic compounds (VOCs), SVOCs, pesticides, polychlorinated biphenyls (PCBs), metals, selected radionuclide constituents and several miscellaneous analytes. Two VOCs were identified - trichloroethene and tetrachloroethene. No SVOCs, pesticides or PCBs were detected. Several metals were detected. The sludge sample was analyzed for metals and selected radionuclide constituents. Several metals and radionuclides were detected. The analytical results of these samples are presented in Appendix A.1.

A second round of septic tank sludge samples were collected for waste characterization purposes in April 1994 and were analyzed for VOCs, explosives, cyanide, isotopic uranium and thorium, gamma spectroscopy radionuclides, other radionuclides, and RCRA Toxicity Characteristic Leaching Procedure (TCLP) metals. Six VOCs were identified, including acetone, 2-butanone (MEK) and trace concentrations of carbon disulfide, chloromethane, and methylene chloride. Explosive compounds and cyanide were not detected. Two RCRA metals, barium and lead, were detected in the sludge; however, only a trace concentration of lead was detected. A number of radionuclides were detected in the analyses for radionuclides.

Liquid from the septic tank were also sampled in April. It was tested for VOCs, explosives, and cyanide. No analytes were detected in the liquid samples. The analytical results of the second round of septic tank samples are presented in Appendix A.2.

A third round of waste characterization sludge samples were collected in June 1994 and were analyzed for SVOCs, VOCs, RCRA total and TCLP metals, cyanide, explosives, hexavalent chromium and isotopic uranium. Two SVOCs, bis (2-ethylhexyl) phthalate and pyrene, were detected in trace concentrations. One VOC, methylene chloride, was detected in a trace concentration; it was also detected in a laboratory blank. Six RCRA metals were identified in the lab test for total RCRA metals, but only one of the six metals was detected in the TCLP-derived leachate. Cyanide, explosives, and hexavalent chromium were not detected in the samples. The analytical results of the third round of septic tank sludge characterization samples are also presented in Appendix A.2.

A geophysical survey was conducted in June 1994 using two different inductive electromagnetic (EM) ground conductivity meters, an EM-31 and an EM-38 (Lamb 1994). The purpose of this survey was to locate and delineate any possible plume of elevated moisture. However, "the EM-38 and EM-31 data at this site were dominated by interference from three buried utility lines. This interference obscured any septic effects."

A passive soil-gas survey conducted in June 1994 used PETREXTM sampling tubes to identify any releases of VOCs and SVOCs from the seepage pit that may have occurred. A PETREXTM tube soil-gas survey is a semi-quantitative screening procedure that can be used to identify many volatile and semivolatile organic compounds. This technique may be used to guide VOC and SVOC site investigations. The advantages of this sampling methodology are that large areas can be surveyed at relatively low cost, the technique is highly sensitive to organic vapors, and the result produces a measure of soil vapor chemistry over a two- to three-week period rather than at one point in time. Each PETREXTM soil-gas sampler consists of two activated charcoal coated wires housed in a reusable glass test tube container. At each sampling location, sample tubes are buried in an inverted position so that the mouth of the sampler is about 1 foot below grade. Samplers are left in place for a two- to three-week period, and are then removed from the ground and sent to the manufacturer, Northeast Research Institute (NERI), for analysis using thermal desorption-gas chromatography/mass spectrometry. The analytical laboratory reports all sample results in terms of "ion counts" instead of concentrations, and identifies those samples that contain compounds above the PETREXTM technique detection limits. In NERI's experience, levels below 100,000 ion counts for a single compound (such as perchloroethene [PCE] or trichloroethene [TCE]), and 200,000 ion counts for mixtures (such as BTEX or aliphatic compounds [C4-C11 cycloalkanes]), under normal site conditions, would not represent detectable levels by standard quantitative methods for soils and/or groundwater (NERI June 1995).

Four PETREXTM tube samplers (samplers 148 through 151) were placed in a grid pattern in the vicinity of the solids retention tank and the two outfalls and seven PETREXTM tube samplers (samplers 432 through 438) were placed in a grid pattern that surrounded the septic tank and seepage pit (Figure 1-2) (SNL/NM June 1994). The results from all the samplers at ER Site 151 caused NERI to classify ER Site 151 as having 'no significant soil gas detections.' The analytical results from the ER Site 151 passive soil gas survey are presented in Appendix A.3.

3.5 Assessment of Gaps in Information

The most recent material in the tank was not necessarily representative of all discharges to the unit that have occurred since it was put into service in 1962. The analytical results of the various rounds of septic tank sampling were used, along with process knowledge and other available information, to help identify the most likely COCs that might be found in soils surrounding the septic tank and seepage pit, and the surface outfalls, to help select the types of analyses to be performed on soil samples collected from the site. While the history of past releases at the site is incomplete, analytical data from confirmatory soil samples collected in October 1994 and January 1995 (discussed below) are sufficient to determine whether releases of COCs occurred at the site.

3.6 Confirmatory Sampling

Although the likelihood of significant releases of hazardous constituents at ER Site 151 was considered low, confirmatory soil sampling was conducted to determine whether COCs above background or detectable levels were released via the drains at this site. Samples were collected from the area immediately around the seepage pit and the septic tank in October 1994 (SNL/NM October 1994a) and from near the surface outfalls in January 1995 (SNL/NM January 1995a). The sampling operation near the seepage pit is shown in the upper photograph of Figure 3. An attempt was made to sample the surface outfalls in October 1994 using a large Geoprobe™. Because the large Geoprobe™ met repeated resistance at 11 feet, a backhoe was used to obtain the deep samples near the surface outfall in January 1995. The confirmatory soil sampling program was performed in accordance with the rationale and procedures described in the Septic Tank and Drainfields (ADS-1295) RCRA Facility Investigation Work Plan (SNL/NM March 1993), and addenda to the Work Plan developed during the OU 1295 project approval process (IT March 1994 and SNL/NM November 1994). A summary of the types of samples, number of sample locations, sample depths and analytical requirements for confirmatory soil samples collected at this site is presented in Table 3-1.

Soil samples were collected from two borings located on opposite sides of the seepage pit and on opposite sides of the septic tank in October 1994. The depth to the bottom of each of these features was measured in the field. In each seepage pit boring, two depth intervals were sampled, the first starting at the bottom of the seepage pit, which was approximately 12 feet below ground surface (BGS), and the second at 10 feet below the top of the first sampling interval (25 feet BGS).



Collecting soil samples next to the seepage pit with the Geoprobe™, 10/17/94. View looking southeast.



Septic tank septage removal and cleaning operation, 10/11/95.
View looking south.

Figure 3-1: ER Site 151 Photographs

Table 3-1
ER Site 151: Confirmatory Sampling Summary Table

Sampling Location	Analytical Parameters	Number of Sample Locations	Top of Sampling Intervals at Each Boring Location	Total Number of Investigative Samples	Total Number of Duplicate Samples	Date(s) Samples Collected
Seepage pit	VOCs	2	15', 25'	4		10/13/94
	SVOCs	2	15', 25'	4		
	RCRA metals + Cr ⁶⁺	2	15', 25'	4		
	Cyanide	2	15', 25'	4		
	TNT screen	2	15', 25'	4		
	Soil pH	2	15', 25'	4		
	Isotopic uranium	2	15', 25'	4		
	Gamma spec. & Tritium composite	2	15', 25'	2		
Septic tank	VOCs	2	12'	2		10/17-1894
	SVOCs	2	12'	2		
	RCRA metals + Cr ⁶⁺	2	12'	2		
	Cyanide	2	12'	2		
	TNT screen	2	12'	2		
	Isotopic uranium	2	12'	2		
Surface Outfalls	VOCs	2	1', 11'	4	one at 11'	1/19/95
	SVOCs	2	1', 11'	4	one at 11'	
	RCRA metals + Cr ⁶⁺	2	1', 11'	4	one at 11'	
	Cyanide	2	1', 11'	4	one at 11'	
	TNT screen	2	1', 11'	4	one at 11'	
	Soil pH	2	1', 11'	4	one at 11'	
	Isotopic uranium	2	1', 11'	4	one at 11'	
	Gamma spec. & Tritium composite	2	1', 11'	2		

Notes

Cr⁶⁺ = Hexavalent chromium

Iso. = Isotopic

RCRA = Resource Conservation and Recovery Act

Spec. = Spectroscopy

SVOCs = Semivolatile organic compounds

TNT = Trinitrotoluene

VOCs = Volatile organic compounds

In each of the two septic tank borings, there was one depth interval sampled. It started at the bottom of the septic tank (12 feet BGS) (SNL/NM October 1994a).

Finally, in January 1995 soil samples were collected from near the surface outfalls using the backhoe (SNL/NM January 1995a). One set of samples was collected from the surface outfall coming from Building 9940-A. Samples were collected at 1 and 11 feet BGS. Samples were also collected at 1 and 11 feet BGS at a second location that was approximately 20 feet from the surface outfall from Building 9940-A and 10 feet from the surface outfall of the pipe from the solids retention tank.

The Geoprobe™ sampling system was used to collect subsurface soil samples near the septic tank and seepage pit at this site. The Geoprobe™ sampling tool was fitted with a butyl acetate (BA) sampling sleeve and was then hydraulically driven to the top of the designated sampling depth. The sampling tool was opened, and driven an additional two feet in order to fill the two-foot long by approximately 1.25-inch diameter BA sleeve. The sampling tool and soil-filled sleeve were then retrieved from the borehole. In order to minimize the potential for loss of volatile compounds (if present), the soil to be analyzed for VOCs was not emptied from the BA sleeve into another sample container. The filled BA sleeve was removed from the sampling tool, and the top seven inches were cut off. Both ends of the seven-inch section of filled sleeve were immediately capped with a teflon membrane and rubber end cap, sealed with tape, and placed in an ice-filled cooler at the site. The soil in this section of sleeve was submitted for a VOC analysis.

Soil from the remainder of the sleeve was then emptied into a decontaminated mixing bowl. Following this, additional sampling runs were completed at each interval in order to recover enough soil to satisfy sample volume requirements for the interval. Soil recovered from these additional runs was also emptied into the mixing bowl, and blended with soil from the first sampling run. The soil was then transferred from the bowl into sample containers using a decontaminated plastic spatula.

VOC soil samples from the outfall sample locations were scooped from the backhoe bucket into a sample container. The sample containers were placed in an ice-filled cooler.

Seepage pit, septic tank and outfall samples were analyzed for VOCs, SVOCs, cyanide, RCRA metals, and hexavalent chromium by an offsite commercial laboratory. Samples were shipped to the offsite commercial laboratories by an overnight delivery service. Additional soil samples were also collected from the seepage pit, septic tank, and outfall sampling intervals and were submitted to the SNL/NM ER field laboratory for trinitrotoluene (TNT) analyses using a field screening immunoassay technique. To determine if radionuclides were released from past activities at this site, samples were collected from the seepage pit shallow and deep sampling intervals as well as the outfall shallow and deep intervals, to be analyzed by an offsite commercial laboratory for isotopic uranium. Composite samples were also collected to be: a) analyzed by an offsite commercial laboratory for tritium and b) screened for other radionuclides using SNL/NM in-house gamma spectroscopy.

Routine SNL/NM chain-of-custody and sample documentation procedures were employed for all samples collected at this site.

Quality assurance/quality control (QA/QC) samples collected during this effort consisted of a set of duplicate soil samples from one of the deep sampling intervals at OF-1 (Figure 1-2). The duplicate sample was analyzed for the same non-radiologic constituents as the other outfall soil samples. A set of aqueous equipment rinsate samples were also analyzed for most of the same non-radiological constituents as the other soil samples. No significant concentrations of COCs were detected in the equipment blank sample, and the concentrations of constituents detected in the duplicate soil samples were in good agreement with those detected in the equivalent field sample from the same interval. Also, a soil trip blank sample was included with each of the two shipments of ER Site 151 seepage pit, septic tank, and outfall soil samples to the offsite laboratory and were analyzed for VOCs only.

Four or more of the following compounds were detected in each of the trip blanks: acetone, 2-hexanone, methyl ethyl ketone (MEK), methyl isobutyl ketone (MIBK), methylene chloride, toluene, and total xylenes. These common laboratory contaminants were either not detected, or were found in lower concentrations in the site samples than in the trip blanks. Soil used for the trip blanks was prepared by heating the material, and then transferring it immediately to the sample container. This heating process drives off any residual organic compounds (if present), and soil moisture, that may be contained in the material. It is thought that when the soil trip blank container was opened at the laboratory, it immediately adsorbed both moisture and VOCs present in the laboratory atmosphere, and therefore became contaminated.

Summaries of all constituents detected in these confirmatory samples by either commercial laboratories or by the SNL/NM field laboratory are presented in Tables 3-2, 3-3, and 3-4. Results of the SNL/NM in-house gamma spectroscopy composite soil sample screening for other radionuclides are presented in Appendices A.4 through A.7. Complete soil sample analytical data packages are archived in the SNL/NM Environmental Operations Records Center and are readily available for review and verification (SNL/NM October 1994b and January 1995b).

3.7 Risk Analysis

As shown in Table 4, tritium was detected in soil moisture from the shallow interval seepage pit composite sample at an activity level of 2,365 picocuries per liter (pCi/L), and was not detected in the deep interval composite sample for the seepage pit. Tritium was also detected in soil moisture from the shallow interval outfall composite sample at an activity level of 230 pCi/L, and was not detected in the deep interval composite sample from the outfall. Background tritium activity levels for SNL/NM soils were not reported in the SNL/NM background study (IT March 1996). The soil moisture contained in shallow soil samples such as these represents either infiltrated precipitation, or water discharged from the Building 9940 to the seepage pit. It is therefore appropriate to compare the tritium activity level detected in the sample soil moisture to naturally occurring tritium levels found in precipitation or drinking water samples. The largest tritium activity level (2,365 pCi/L) detected in soil samples at this site was therefore compared to and found to be above the naturally occurring tritium activity range of 100 to 300 pCi/L found in precipitation samples collected from locations throughout the U.S., and 100 to 400 pCi/L in drinking water samples collected from locations around the country (EPA October 1993). A risk assessment was therefore performed to further evaluate this tritium activity level. The risk calculation was designed to produce a conservatively large estimate of radiation dose to counter uncertainties in the soil analytical data.

Table 3-2

ER Site 151

**Summary of Organic and Other Constituents in Confirmatory Soil Samples
Collected Around the Septic Tank, Seepage Pit, and Solids Retention Tank Outfall**

Sample Number	Sample Matrix	Sample Type	Sample Date	Sample Location (Figure 2)	Sample Interval (fbs)	Top of Sample	VOCs Method 8240										SVOCs Method 8270	Cyanide Method 9010/9012	TNT Screen Colorimetric method based on EPA 8515	Units
							Acetone	2-Hexa- none	MEK	MIBK	Chlorid	Meth. Toluene	Total Xylenes							
Septic Tank Soil and QA Samples:																				
018132-1.2	Soil	Field	10/17/94	ST-1	12		ND	ND	ND	2.6 B,J	ND	ND	ND	ND	ND	ND	ug/kg			
018133-1.2	Soil	Field	10/17/94	ST-2	12		ND	ND	ND	2.7 B,J	ND	ND	ND	ND	ND	ND	ug/kg			
018134-1	Soil	TB	10/17/94	Site 151	NA		140	ND	54	ND	12 B	9.8	ND	NS	NS	NS	ug/kg			
Seepage Pit Soil Samples:																				
018128-1.2	Soil	Field	10/13/94	SP-1	15		ND	ND	ND	1.9 B,J	ND	ND	ND	ND	ND	ND	ug/kg			
018129-1.2	Soil	Field	10/13/94	SP-1	25		ND	ND	ND	2.6 B,J	ND	ND	ND	ND	ND	ND	ug/kg			
018130-1.2	Soil	Field	10/13/94	SP-2	15		ND	ND	ND	2.7 B,J	ND	ND	ND	ND	ND	ND	ug/kg			
018131-1.2	Soil	Field	10/13/94	SP-2	25		ND	ND	ND	1.9 B,J	ND	ND	ND	ND	ND	ND	ug/kg			
Solids Retention Tank Outfall Soil and QA Samples:																				
018929-1.2	Soil	Field	1/19/95	OF-1	1		ND	ND	ND	2.6 B,J	ND	ND	ND	ND	ND	ND	ug/kg			
018930-1.2	Soil	Field	1/19/95	OF-1	11		ND	ND	ND	1.9 B,J	ND	ND	ND	ND	ND	ND	ug/kg			
018931-1.2	Soil	Dupl.	1/19/95	OFD-1	11		ND	ND	ND	2.3 B,J	ND	ND	ND	ND	ND	ND	ug/kg			
018932-1.2	Soil	Field	1/19/95	OF-2	1		ND	ND	ND	2.5 B,J	ND	ND	ND	ND	ND	ND	ug/kg			
018933-1.2	Soil	Field	1/19/95	OF-2	11		1.1 J	ND	ND	ND	ND	ND	ND	NS	NS	NS	ug/kg			
018934-1	Soil	TB	1/19/95	Site 151	NA		160	7 J	71	5.2 J	4.7 B,J	1.8 J	2 J	NS	NS	NS	ug/kg			
018935-1.2	Water	EB	1/23/95	Site 151	NA		ND	ND	ND	1.5 J	ND	ND	ND	3.4 J	ND	NS	ug/L			
Laboratory Reporting Limit for Soil							10	10	10	10	5	5	5	330	1,000	1,000	ug/kg			
Laboratory Reporting Limit for Water							10	10	10	10	5	5	5	10	10	NA	ug/L			
Proposed Subpart S Action Level For Soil							8E+06	None	5E+07	4E+06	9E+04	2E+07	2E+08	2E+06	4E+04	4E+04	ug/kg			

Notes:

B = Compound detected in associated blank sample

BEHP = Bis(2-Ethylhexyl)phthalate

Dupl. = Duplicate soil sample

EB = Equipment blank

fbs = feet below ground surface

J = Result is detected below the reporting limit or is an estimated concentration.

MEK = Methyl ethyl ketone

Meth. chloride = Methylene chloride

MIBK = Methyl Isobutyl ketone,

NA = Not applicable

ND = Not detected

NS = No sample

QA = Quality assurance

SVOCS = Semivolatile organic compounds

TB = Trip blank

ug/kg = Micrograms per kilogram

ug/L = Micrograms per liter

VOCs = Volatile organic compounds

Table 3-3

ER Site 151

**Summary of RCRA Metals and Hexavalent Chromium in Confirmatory Soil Samples
Collected Around the Septic Tank, Seepage Pit, and Solids Retention Tank Outfall**

Top of Sample Interval						RCRA Metals, Methods 6010 and 7471										Other Metals: Cr ⁶⁺ Method 7196	Units
Sample Number	Sample Matrix	Sample Type	Sample Date	Sample Location (Figure 2)	Sample Interval (ftgs)	As	Ba	Cd	Cr, total	Pb	Hg	Se	Ag				
Septic Tank Soil Samples:																	
018132-2	Soil	Field	10/17/94	ST-1	12	2.9	84.2	ND	8.1	ND	ND	ND	ND	ND	mg/kg		
018133-2	Soil	Field	10/17/94	ST-2	12	3.1	194	ND	10.2	5.7	ND	ND	ND	ND	mg/kg		
Seepage Pit Soil Samples:																	
018128-2	Soil	Field	10/13/94	SP-1	15	2	115	ND	11.4	3.8 J	ND	ND	ND	ND	mg/kg		
018129-2	Soil	Field	10/13/94	SP-1	25	2.2	280	ND	8.5	5.3	ND	ND	ND	ND	mg/kg		
018130-2	Soil	Field	10/13/94	SP-2	15	2.1	200	ND	14.4	7.1	ND	ND	ND	ND	mg/kg		
018131-2	Soil	Field	10/13/94	SP-2	25	1.9	74.6	ND	8.6	ND	ND	ND	ND	ND	mg/kg		
Solids Retention Tank Outfall Soil and QA Samples:																	
018929-2	Soil	Field	1/19/95	OF-1	1	3.2	75.2	ND	5.1	4.8 J	ND	ND	ND	ND	mg/kg		
018930-2	Soil	Field	1/19/95	OF-1	11	2.5	90.5	ND	5.5	4.5 J	ND	ND	ND	ND	mg/kg		
018931-2	Soil	Dupl.	1/19/95	OFD-1	11	2.1	43.4	ND	3.2	4.3 J	ND	ND	ND	ND	mg/kg		
018932-2	Soil	Field	1/19/95	OF-2	1	3.3	74.1	ND	5.9	4.6 J	ND	ND	ND	ND	mg/kg		
018933-2	Soil	Field	1/19/95	OF-2	11	2	84.3	ND	5.6	3.1 J	ND	ND	ND	ND	mg/kg		
018935-3	Water	EB	1/23/95	Site 151	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	mg/L		
Laboratory Reporting Limit for Soil						1	1	0.5	1	5	0.1	0.5	1	0.05 - 0.1	mg/kg		
Laboratory Reporting Limit for Water						0.01	0.01	0.005	0.01	0.003	0.0002	0.005	0.01	NA	mg/L		
Number of SNL/NM Background Soil Sample Analyses *						15	727	1,740	647	536	1,724	2,134	2,302	393	NA		
SNL/NM Soil Background Range *						2.1-7.9	0.5-495	0.0027-6.2	0.5-31.4	0.75-103	0.0001-0.68	0.037-17.2	0.0016-8.7	0.02-<2.5	mg/kg		
SNL/NM Soil Background UTL or 95th Percentile *						7	214	0.9	15.9	11.8	<0.1	<1.0	<1.0	<2.5	mg/kg		
Proposed Subpart S Action Level For Soil						0.50	6,000	80	80,000 **	400 ***	20	400	400	400 **	mg/kg		

Table 3-3, concluded:

ER Site 151

Summary of RCRA Metals and Hexavalent Chromium in Confirmatory Soil Samples
Collected Around the Septic Tank, Seepage Pit, and Solids Retention Tank Outfall

Notes:

As = Arsenic. Arsenic background concentrations presented above are based on analyses of subsurface soil samples collected in the Coyote Test Field (CTF) area.
Ba = Barium. Barium background concentrations presented above are based on analyses of subsurface soil samples collected in the Southwest and CTF areas.

Cd = Cadmium. Cadmium background concentrations presented above are based on analyses of subsurface soil samples collected in the North, Tijeras, Southwest, CTF, and Offsite areas.

Cr = Chromium. Chromium background concentrations presented above are based on analyses of subsurface soil samples collected in the Southwest area.
Cr⁶⁺ = Hexavalent chromium. Hexavalent chromium background concentrations presented above are based on analyses of surface and subsurface soil samples collected in the Southwest area.

Pb = Lead. Lead background concentrations presented above are based on analyses of subsurface samples collected in the Southwest and Offsite areas.

Hg = Mercury. Mercury background concentrations presented above are based on analyses of subsurface soil samples collected in the North, Tijeras, Southwest, CTF and Offsite areas.

Se = Selenium. Selenium background concentrations presented above are based on analyses of surface and subsurface soil samples collected in the North, Tijeras, Southwest, CTF and Offsite areas.

Ag = Silver. Silver background concentrations presented above are based on analyses of subsurface soil samples collected in the North, Tijeras, Southwest, CTF, and Offsite areas.

Dupl. = Duplicate soil sample

EB = Equipment blank

fbgs = Feet below ground surface

J = Result is detected below the reporting limit or is an estimated concentration.

mg/kg = Milligrams per kilogram

mg/L = Milligrams per liter

NA = Not applicable

ND = Not detected

NS = No sample

QA = Quality assurance

UTL = Upper Tolerance Limit

* IT March 1996

** 80,000 mg/kg is for Cr³⁺ only. For Cr⁶⁺, proposed Subpart S action level is 400 mg/kg.

*** No proposed Subpart S action level for lead in soil. 400 ppm is EPA proposed action level (EPA 1994)

Table 3-4

ER Site 151

Summary of Isotopic Uranium and Tritium in Composite Confirmatory Soil Samples
Collected Around the Septic Tank, Seepage Pit, and Solids Retention Tank Outfall

Isotopic Uranium Method NAS-NS-3050 (pCi/g)													Tritium Method EERF H.01 (pCi/L)																															
Top of Sample					Sample Location (Figure 2)		Sample Date		Sample Type		Sample Matrix		Sample Number		U-234 Result		U-234 Error *		U-234 M.D.A.		U-235/ U-236 Result		U-235/ U-236 Error *		U-235/ U-236 M.D.A.		U-238 Result		U-238 Error *		U-238 M.D.A.													
Septic Tank Soil Samples:													ST-1		10/13/94		Field		Soil		018132-5		0.26		0.07		0.01		0.013		0.013		0.009		0.21		0.06		0.01					
													ST-2		10/13/94		Field		Soil		018133-5		0.27		0.07		0.01		0.024		0.019		0.009		0.24		0.07		0.01					
Seepage Pit Soil Samples:																																												
													SP-1		10/13/94		Field		Soil		018128-5		0.56		0.13		0.01		0.031		0.022		0.015		0.46		0.11		0.01					
													SP-1		10/13/94		Field		Soil		018129-5		0.31		0.08		0.01		0.018		0.015		0.008		0.27		0.07		0.01					
													SP-2		10/13/94		Field		Soil		018130-5		0.32		0.08		0.01		0.012		0.012		0.008		0.28		0.07		0.01					
													SP-2		10/13/94		Field		Soil		018131-5		0.27		0.07		0.02		0.024		0.019		0.019		0.35		0.09		0.01					
													SP-1/2		10/13/94		Compos.		Soil		018128-4																							
													SP-1/2		10/13/94		Compos.		Soil		018129-4																							
Solids Retention Tank Outfall and QA Soil Samples:																																												
													OF-1		1/19/95		Field		Soil		018929-5		0.49		0.19		0.16		0.04 J		0.067		0.12		0.71		0.23		0.17					
													OF-1		1/19/95		Field		Soil		018930-5		0.86		0.18		0.084		0.017 J		0.03		0.054		1		0.2		0.06					
													OFD-1		1/19/95		Dupl.		Soil		018931-5		0.86		0.25		0.11		0.028		0.065		0.12		0.93		0.27		0.13					
													OF-2		1/19/95		Field		Soil		018932-5		0.76		0.17		0.066		0.018 J		0.027		0.043		0.7		0.16		0.051					
													OF-2		1/19/95		Field		Soil		018933-5		0.7		0.16		0.084		0.038 J		0.049		0.08		0.82		0.18		0.09					
													Site 151		1/23/95		EB		Water		018935-6		0.067 J		0.058		0.083		0.015 J		0.033		0.062		0.05		0.052		0.079					
													OF-1/2		1/19/95		Field		Soil		018929-3																							
													OF-1/2		1/19/95		Field		Soil		018930-3																							
Number of SNL/NM Background Soil Sample Analyses **													14												283								90											
SNL/NM Soil Background Range **													0.44-5.02												0.004-3								0.153-2.3											
SNL/NM Soil Background 95th Percentile **													<5.02														0.16								1.4									
Nationwide Tritium Range in Precipitation and Drinking Water ***													NA														NA								NA									

Table 3-4, concluded

ER Site 151

Summary of Isotopic Uranium and Tritium in Composite Confirmatory Soil Samples
Collected Around the Septic Tank, Seepage Pit, and Solids Retention Tank Outfall

Notes:

- U-234 = Uranium 234. Uranium 233/234 background concentrations presented above are based on analyses of surface and subsurface soil samples collected in the Southwest area.
- U-235 = Uranium 235. Uranium 235 background concentrations presented above are based on analyses of surface and subsurface soil samples collected in the Southwest area.
- U-236 = Uranium 236
- U-238 = Uranium 238. Uranium 238 background concentrations presented above are based on analyses of surface and subsurface soil samples collected in the Southwest area.

Compos. = Composite

D.L. = Detection limit

EB = Equipment blank

fbs = Feet below ground surface

J = Result is detected below the reporting limit or is an estimated concentration.

ND = Not detected

pCi/g = Picocuries per gram

U = Undefined for SNL/NM soils

* Error = \pm 2 sigma uncertainty

** 11 March 1996

*** EPA October 1993

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Appendix J, Section 1.3.6 of the PIP (SNL/NM February 1995) stipulates that, for the purpose of computing media action levels, the total radiation dose at a site should not be greater than 15 millirem/year (mrem/yr). 15 mrem/yr is also the maximum annual effective dose for all pathways that are being considered in the preliminary staff working draft of the EPA Radiation Site Cleanup regulation (EPA 1994). Therefore:

- if the dose estimate is unacceptable (greater than 15 mrem/yr), further investigation and remediation may be needed; or
- if the dose estimate is acceptable, the potential for health hazards at the site is extremely low, and further remedial actions are not needed.

The dose estimate for the tritium activity level cited above was computed using methods and equations promulgated in proposed Subpart S documentation (EPA July 1990). Accordingly, all calculations were based on the very conservative assumption that the receptor dose from radionuclides results from ingestion of 0.2 grams per day of contaminated soil for each of the 365 days in a year.

Calculation of radionuclide doses require values of dose conversion factors for internal radiation from ingestion [DCF(i)], which are used to convert radionuclide activities (in units pCi/g) into effective dose equivalents (in units of mrem/yr). A published DCF(i) value was found for tritium (0.000000063 [6.3E-08] mrem/pCi) (Gilbert et al. 1989); this DCF(i) value was used in the risk calculation.

To assure that the computed doses were conservatively large, the maximum observed activity of tritium detected at this site (2,365 pCi/L) was employed in the risk calculation. Analytical results for tritium in soil moisture are reported by the laboratory in units of pCi/L, and must be converted to units of pCi/g for the risk calculation presented below. The following conversion calculation was used:

Determined from laboratory results: 100.7 grams of sample, 3.5% by weight soil moisture in sample, tritium result of 2,365 pCi/L in soil moisture (SNL/NM October 1994b)

(1) $2,365 \text{ pCi/L} \times 1 \text{ L}/1000 \text{ g} = 2.365 \text{ pCi/g}$ of soil moisture

(2) $100.7 \text{ grams of sample} \times 0.035 = 3.5 \text{ g}$ of soil moisture in sample

(3) $3.5 \text{ g of soil moisture} \times 2.365 \text{ pCi/g in soil moisture} = 8.28 \text{ pCi}$ of tritium activity in this 100.7 g soil sample

(4) $8.28 \text{ pCi in } 100.7 \text{ g of soil sample} = 0.082 \text{ pCi/g}$ for this sample

Following proposed Subpart S methodology, the equation and parameter values used to calculate the summed radiation dose was:

$$\text{DOSE} = \sum [\text{DSR}(i) \times \text{S}(i)],$$

where DOSE = total effective dose equivalent (mrem/yr);

DSR(i) = dose-to-soil concentration ratio for the i^{th} radionuclide = $I \times \text{DCF}(i)$;

I = soil ingestion rate = 0.2 grams/day = 73 grams/year;

DCF(i) = internal radiation dose conversion factor for the i^{th} radionuclide (mrem/pCi); and

S(i) = soil concentration of the i^{th} radionuclide (pCi/g).

The radionuclide risk calculation shows that the radiation dose from the highest tritium activity level (2,365 pCi/L, or 0.082 pCi/g) found at this site is 3.8 E-07 mrem/yr which is much less than 15 mrem/yr. Therefore, the site is considered to be risk-free in terms of tritium contamination.

3.8 Rationale for Pursuing a Risk-Based NFA Decision

As discussed in Section 3.4 above, the passive soil gas survey did not identify any significant concentrations of soil gas at any of the 11 PETREXTM soil-gas sampling locations at this site.

Confirmatory soil sampling around the seepage pits and septic tank did not identify any residual COCs indicating past discharges that could pose a threat to human health or the environment. As shown in Table 2, only two VOCs, acetone and methylene chloride, which are common laboratory contaminants, were detected at below-reporting-limit concentrations in soil samples collected from this site. No SVOCs, cyanide, or TNT were detected in any of the site soil samples.

As shown on Table 3, soil sample analytical results indicate that the nine metals that were targeted in the Site 151 investigation were either (1) not detected, or (2) were detected in concentrations below the background UTL or 95th percentile concentrations presented in the SNL/NM study of naturally-occurring constituents (IT March 1996), or (3) were less than the proposed Subpart S or other action levels for these metals.

Isotopic uranium activity levels that were detected in the soil samples were found to be below the corresponding 95th percentile background activity levels presented in the IT March 1996 report for those radionuclides (Table 4). The tritium activity level detected in the seepage pit shallow interval sample was determined to result in a radiation dose much lower than the maximum acceptable radiation dose of 15 mrem/yr at a site presented in the PIP (SNL/NM February 1995). Also, the gamma spectroscopy semi-qualitative screening of shallow and deep interval composite soil samples did not indicate that the soil at ER Site 151 had been contaminated by other radionuclides (Appendices A.4 through A.7).

Finally, the ER Site 151 septic tank contents were removed and the tank was cleaned in November 1995 (SNL/NM November 1995). The tank was then inspected by a representative of the New Mexico Environment Department (NMED) to verify that the tank contents had been removed and the tank had been closed in accordance with applicable State of New Mexico regulations (SNL/NM November 1995).

4. CONCLUSION

Sample analytical results generated from this confirmatory sampling investigation have shown that detectable or significant concentrations of COCs are not present in soils at ER Site 151, and that additional investigations are unwarranted and unnecessary. Based on archival information, chemical and radiological analytical results of soil samples collected next to the seepage pits, septic tank, and outfalls, and comparison of the results with action levels, SNL/NM has demonstrated that any contaminants present at this site pose an acceptable level of risk under current and projected future land use (Criterion 5 of Section 1.2). Therefore, ER Site 151 is recommended for an NFA determination.

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